

5.8 Traffic and Transportation

Presented in this section are the results of an evaluation of the impacts of onsite shipments of LLW, MLLW (including melters), TRU wastes (including mixed TRU wastes), and ILAW to treatment and disposal facilities; shipments of LLW, MLLW, and TRU wastes from offsite to Hanford; shipments of TRU wastes from Hanford to WIPP; and the shipment of construction and capping materials. The methods and data used in this analysis are described in detail in Volume II, Appendix H.

The types of potential transportation impacts evaluated and the approaches taken to quantify the transportation impacts are summarized in the following paragraphs.

Radiological impacts of routine (incident-free) transport. These potential impacts result from routine or incident-free transportation of radioactive materials where the shipments arrive at their destinations without release of the shipment's contents. The potential impacts would result from exposure of truck crews and populations on or near the highways to low levels of radiation emitted from shipping containers containing radioactive materials. The RADTRAN 5 computer code (Neuhauser et al. 2003) was used to estimate the potential impacts of incident-free transportation of waste materials. Route data were developed using the TRAGIS computer code (Johnson and Michelhaugh 2000), the current version of which is based on the 2000 Census. Because most of the shipments would occur in the next decade, the population estimates were not adjusted over time.

Radiological impacts of vehicular accidents. These potential impacts would result from accidental releases of radioactive material in transit. Accident impacts are determined by combining the probabilities and consequences of potential transportation accidents, ranging from minor to severe accidents, and then integrating them over the entire shipping campaign. The RADTRAN 5 computer code was used to quantify these impacts. An analysis of the impacts of severe but highly unlikely TRU waste accidents is also presented (see Volume II, Appendix H, Section H.3.2.3.2). Given the range of accidents and the resulting impacts analyzed in this EIS, these impacts were considered to also represent those that could occur from a terrorist attack (see Volume II, Appendix H, Section H.8).

Non-radiological impacts of routine (incident-free) transportation. Non-radiological impacts of routine transportation are the potential health effects that would result from routine emissions of hydrocarbon pollutants and dust from the truck tractors used to haul waste and capping and construction materials. These non-radiological impacts are estimated using a unit-factor approach (that is, latent cancer fatalities per kilometer) using data from Biwer and Butler (1999).

Non-radiological impacts of vehicular accidents. The metric used for these potential impacts is the number of fatalities that would result from physical trauma as a result of vehicular accidents involving the heavy trucks used to transport waste and construction and capping materials. A unit-factor approach based on accidents and fatalities per kilometer was used to estimate these non-radiological accident impacts. Unit-factor data were taken from Green et al. (1996) for onsite shipments and from Saricks and Tompkins (1999) for offsite shipments.

Hazardous chemical impacts of vehicular accidents. These potential impacts would result from accidental releases of hazardous chemical constituents contained in mixed waste (including TRU mixed waste). A maximum credible accident approach was used to estimate the impacts. Hazardous chemical release and atmospheric dispersion calculations were performed to determine the maximum downwind concentration from a postulated maximum credible accident to which an individual might be exposed. The downwind concentrations were compared to safe exposure levels for each chemical to determine the potential public and worker impacts. These potential impacts were considered to also represent those that could occur from a successful terrorist attack.

Figure 5.27 illustrates the number of shipment-miles for each waste volume and alternative group. In general, the Hanford Only waste volume for the No Action Alternative results in the fewest shipment-miles because the volume of TRU wastes shipped offsite is lowest for the No Action Alternative and there are no shipments to Hanford from offsite. The Upper Bound waste volume for the action alternative groups results in the highest shipment-miles because of the relatively large volumes of TRU wastes shipped from Hanford to WIPP and offsite LLW, MLLW, and TRU wastes shipped to Hanford.

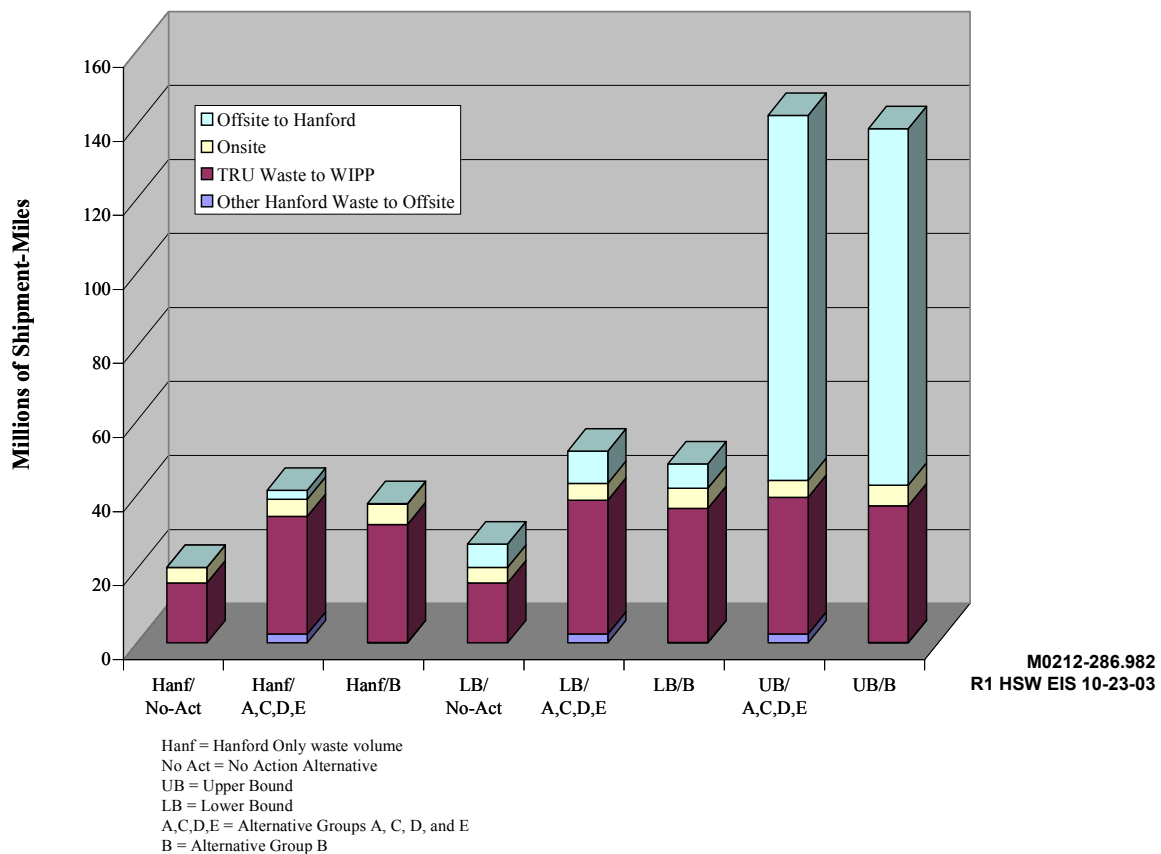


Figure 5.27. Shipment-Miles for Onsite and Offsite Waste Shipments

Table 5.25 presents the results, for the Hanford Only waste volume, of the analysis of potential transportation impacts of shipping LLW, MLLW, TRU wastes, and ILAW onsite, and shipping small volumes of LLW and MLLW to offsite treatment facilities and back. All of the impacts provided in Table 5.25 are in fatalities, except for the estimated number of traffic accidents. Fatalities are expressed in terms of latent cancer fatalities (LCFs) for radiological impacts and routine non-radiological emissions and in terms of trauma-induced fatalities for non-radiological accidents. (Many of the entries in the table are expressed as fractional fatalities, for example, 1E-01 or 0.1 fatalities. However, fatalities occur only as whole numbers and the totals have been obtained by rounding to the nearest whole number.)

Table 5.25. Summary of Potential Radiological and Non-Radiological Transportation Impacts - Hanford Only Waste Volumes, All Alternative Groups^{(a)(b)}

Waste Type	Radiological Impacts, LCFs			Total Number of Accidents	Non-Radiological Impacts	
	Occupational	Non-Occupational	Radiological Accidents		Accident Fatalities	Emissions, LCFs
	Alternative Groups A, C, D, E					
LLW	6E-03	4E-02	3E-06	7.1E-01	3.1E-02	3E-02
MLLW	2E-02	1E-01	2E-06	1.8	4.7E-02	2E-01
TRU	3E-03	3E-02	7E-06	9.1E-02	3.9E-03	4E-03
ILAW	5 E-03	7E-02	2E-09	5.4E-02	2.3E-03	3E-03
Total	0 (3.8E-02)	0 (2E-01)	0 (1E-05)	3 (2.6)	0 (8.5E-02)	0 (2E-01)
	Alternative Group B					
LLW	6E-03	4E-02	3E-06	7.1E-01	3.1E-02	3E-02
MLLW	2E-03	1E-02	2E-07	2.8E-01	1.0E-02	2E-02
TRU	3E-03	3E-02	7E-06	9.1E-02	3.9E-03	4E-03
ILAW	5E-02	7E-01	2E-08	5.4E-01	2.3E-02	3E-02
Total	0 (6E-02)	1 (8E-01)	0 (1E-05)	2 (1.6)	0 (6.8E-02)	0 (8E-02)
	No Action Alternative					
LLW	6E-03	4E-02	3E-06	7.1E-01	3.0E-02	3E-02
MLLW	3E-03	2E-02	7E-08	3.4E-01	1.5E-02	1E-02
TRU	3E-03	4E-02	9E-06	1.1E-01	4.7E-03	5E-03
ILAW	Intrafacility Transfer					
Total	0 (1E-02)	0 (9E-02)	0 (1E-05)	1 (1.2)	0 (5.0E-02)	0 (5E-02)
Note: Totals are rounded to one significant figure. Due to rounding, the sums of the numbers in the table may not exactly match the totals.						
(a) Table 5.25 presents the results, for the Hanford Only waste volume, of the analysis of the potential transportation impacts of shipping LLW, MLLW, TRU wastes, and ILAW onsite in addition to small volumes of Hanford LLW and MLLW offsite for treatment and back. This table does not include the potential transportation impacts of shipping TRU wastes from Hanford to WIPP for disposal. These potential impacts are presented in Table 5.26.						
(b) Radiological impacts (incident-free and accident) are expressed in units of latent cancer fatalities (LCFs). Non-radiological accident impacts are expressed as the expected number of accidents and the resulting non-radiological fatalities. Non-radiological emission impacts are expressed as LCFs.						

Table 5.25 indicates that the No Action Alternative results in the lowest total (that is, the sums across all waste types) potential onsite radiological impacts of all the alternative groups. This is primarily because, under the No Action Alternative, ILAW would be placed in concrete vaults adjacent to the Waste Treatment Plant (WTP) and, thus, is assumed not to involve transportation. The volume of TRU wastes shipped to WIPP is also lower for the No Action Alternative than for the action alternative groups. Of the action alternatives, Alternative Group B has the largest total potential radiological incident-free

impacts. Potential radiological incident-free impacts are dominated by the large volume and high number of shipments of ILAW to a disposal facility located in the 200 West Area. The potential radiological incident-free impacts associated with ILAW transportation are lower for Alternative Groups A, C, D, and E than for Alternative Group B, because in Alternative Groups A, C, D, and E, the shipping distance is shorter since the ILAW disposal facility is assumed to be located in the 200 East Area (the WTP is also located in the 200 East Area). None of the alternative groups was predicted to result in a radiological fatality from onsite shipments of TRU wastes and ILAW, including the Hanford Only waste volumes of MLLW and LLW that would be shipped to offsite treatment facilities and back.

Total non-radiological impacts are also lowest under the No Action Alternative. However, for the action alternatives, the potential impacts are larger for Alternative Groups A, C, D, and E than they are for Alternative Group B. This is because the potential non-radiological impacts are dominated by the shipments of MLLW to the Oak Ridge Reservation (ORR) for treatment and back. There are fewer shipments to ORR and back in Alternative Group B than in Groups A, C, D, and E. None of the action alternative groups was predicted to result in a non-radiological fatality from onsite shipments of solid waste, including the Hanford Only waste volumes of LLW and MLLW that would be shipped to offsite treatment facilities and back.

The potential impacts of shipments of solid waste to Hanford and shipments of TRU wastes from Hanford to WIPP are summarized in Table 5.26. Actual highway routes to and from Hanford were used in the analysis. The table presents the impacts of shipping LLW, MLLW, and TRU wastes from offsite to Hanford, and shipments of TRU wastes from Hanford to WIPP. For the Hanford Only and Lower Bound waste volumes, updated information was obtained from the Solid Waste Integrated Forecast Technical (SWIFT) report (Barcot 2002) to reflect the best available TRU waste volume projections for onsite and offsite (see Volume II, Appendix C). A recent study by DOE (DOE 2002c) to accelerate disposal of TRU wastes considered the creation of a “western hub” to certify TRU wastes from small-quantity sites for shipment to WIPP. Hanford is one of the sites being considered as a potential western hub. If Hanford is designated as a western hub, additional TRU wastes may be shipped from small-quantity sites to Hanford for certification and temporary storage prior to shipment to WIPP for disposal. For purposes of the analysis in this HSW EIS, additional quantities of TRU wastes assumed to be shipped to Hanford as a potential hub site are included in the Upper Bound waste volume, as discussed in Volume II, Appendix C.

As shown in Table 5.26, shipments of the Hanford Only waste volume of TRU waste to WIPP under the No Action Alternative result in the lowest potential radiological impacts. The next highest potential radiological impacts were estimated for the Hanford Only waste volume of TRU waste shipments to WIPP for the action alternatives. There are only small differences between the potential radiological impacts for the Hanford Only (action alternatives) and the Lower Bound waste volumes. These differences in potential impacts are due to the small quantities of LLW, MLLW, and TRU wastes that would be shipped to Hanford and the small additional TRU waste volume that would be shipped from Hanford to WIPP under the Lower Bound waste volume case. The highest potential radiological impacts were estimated for the Upper Bound waste volume. The Upper Bound waste volume case results in higher potential impacts than the other alternative groups because of the LLW, MLLW, and the additional TRU wastes that would be shipped to Hanford and from Hanford to WIPP.

Table 5.26. Summary of Radiological and Non-Radiological Transportation Impacts for Offsite Shipments by Waste Type^(a)

Waste Type	Radiological Impacts			Total Number of Accidents	Non-Radiological Impacts	
	Routine Transport, LCFs		Accidents, LCFs		Fatalities	Emissions LCFs
	Worker	Public	Public			
Hanford Only Waste Volume (TRU Waste—No Action Alternative)						
CH TRU to WIPP	0 (2E-01)	1 (1E+00)	0 (4E-03)	8 (8E+00)	0 (2.8E-01)	0 (2E-01)
Hanford Only Waste Volume (TRU Waste—Action Alternatives)						
CH TRU to WIPP	2E-01	2E+00	5E-03	1E+01	4E-01	2E-01
RH TRU to WIPP	1E-01	2E+00	3E-03	6E+00	2E-01	1E-01
Total	0 (3E-01)	4 (4.4)	0 (8E-03)	17 (17)	1 (5E-01)	0 (3E-01)
Lower Bound Waste Volume						
LLW to Hanford	3E-02	1E-01	3E-03	3E+00	1E-01	1E-01
MLLW to Hanford	2E-04	1E-03	5E-05	3E-02	8E-04	1E-03
CH-TRU Waste to Hanford	6E-05	6E-04	2E-06	4E-03	1E-04	2E-04
RH-TRU Waste to Hanford	1E-03	4E-02	3E-05	8E-02	3E-03	4E-03
TRU Wastes to WIPP	3E-01	4E+00	8E-03	2E+01	6E-01	3E-01
Total	0 (3E-01)	5 (4.5)	0 (1E-02)	20 (20)	1 (6E-01)	0 (4E-01)
Upper Bound Waste Volume						
LLW to Hanford	3E-01	1E+00	4E-03	3E+01	1E+00	1E+00
MLLW to Hanford	2E-01	6E-01	2E-04	2E+01	6E-01	5E-01
CH-TRU Waste to Hanford	4E-03	5E-02	1E-04	1E-01	8E-03	2E-02
RH-TRU Waste to Hanford	2E-03	7E-02	6E-05	1E-01	5E-03	1E-02
TRU Wastes to WIPP	3E-01	4E+00	8E-03	2E+01	6E-01	3E-01
Total	1 (7E-01)	6 (6.4)	0 (1E-02)	73 (73)	2 (2.3)	2 (1.9)
(a) Radiological impacts (incident-free and accident) are expressed in units of LCFs. Non-radiological accident impacts are expressed as the expected number of accidents and the resulting non-radiological fatalities. Non-radiological emissions impacts are expressed as LCFs.						

Also shown in Table 5.26, the potential non-radiological accident fatality estimates are zero for the Hanford Only waste volume TRU waste under the No Action Alternative, one for the Hanford Only waste volume of TRU waste under the action alternatives and the Lower Bound waste volume, and two for the Upper Bound waste volume. Potential non-radiological emissions impacts were two LCFs for the Upper Bound waste volume and zero for the other two volumes. (For perspective it may be noted that over the next 40 years in the United States, several million traffic fatalities would result from other causes.) Figure 5.28 illustrates the transportation routes used in this analysis. The potential impacts presented in this HSW EIS are similar in magnitude to those presented in the WM PEIS (DOE 1997a) and WIPP SEIS-II (DOE 1997b). See additional details in Volume II, Appendix H, Section H.9.



The analysis of maximally exposed individuals under routine transport conditions indicated that the largest individual exposures of non-truck crew members would be received by a service station attendant. The assumption that this same individual attends one-third of the shipments (assuming the service station is visited by all of the shipments and the attendant works one of three shifts per day) to and from Hanford resulted in a radiation exposure of about 0.84 rem (840 mrem) over an approximate 40-year period, resulting in a probability of a latent cancer fatality from this dose of about 0.0005 (that is, 5 chances in 10,000).

An evaluation (see Volume II, Appendix H, Section H.3.2.3.2) of the population and maximum individual exposures that could result from a severe transportation accident in a densely populated urban area was extracted from the WIPP SEIS-II (DOE 1997b). These estimates are pure consequence estimates; that is, the consequence estimates are not weighted by their probability of occurrence, which would be extremely small. These potential impacts were considered to also represent those that could occur from a terrorist attack (see Volume II, Appendix H, Section H.8). The analysis used bounding and average TRU waste inventories to develop a range of potential impacts. The bounding-case WIPP SEIS-II TRU waste inventories were used in the HSW EIS and are reflected in the impact estimates presented in Tables 5.25 and 5.26. The severe transportation accident analysis results demonstrated that, for the bounding TRU waste inventory case, up to 20 LCFs in the exposed population could be inferred. A maximum individual dose of about 125 rem was calculated, resulting in an inferred probability of a latent cancer fatality from this dose of about 0.08 (that is, 8 chances in 100). For the average inventory case, the respective impact estimates are about 4 inferred LCFs in the exposed population and an LCF probability of about 0.05 to the maximally exposed individual.

Table 5.27 provides estimates of the total shipment-miles and potential impacts for waste shipments within the Hanford Site, from offsite to Hanford, and from Hanford to offsite. The table illustrates that the impacts are approximately a function of the total distance traveled. Shipments from Hanford to offsite (which include a small number of LLW and MLLW shipments to offsite treatment facilities and back and shipments of TRU wastes from Hanford to WIPP) represent the largest impacts for all the waste transportation configurations shown in Table 5.27. The potential impacts of waste shipments from offsite to Hanford represent only a small fraction of the transportation impacts estimated for the Hanford Only and Lower Bound waste volumes. The potential impacts of offsite shipments to Hanford represent a substantial fraction of the total impacts of the Upper Bound waste volume case, but are still smaller than the impacts of shipments from Hanford to offsite facilities. The total potential latent cancer fatalities (sum of radiological incident-free impacts, radiological accident risks, and non-radiological emissions impacts) and non-radiological accident fatality estimates are illustrated in Figures 5.29 and 5.30, respectively.

The total projected radiation and emissions impacts in Table 5.27 range from about two to ten over the approximately 40 years of waste operations. For perspective, according to the U.S. Centers for Disease Control, National Center for Health Statistics, a total of 10,802 residents of the state of Washington and 7,057 residents of the state of Oregon died of cancer in 2001 (CDC 2003). The cancer mortality rates were 193 and 196 per 100,000 residents, respectively. A total of 36,245 residents of Washington and Oregon were estimated by TRAGIS to live within 800 meters of the highway route between Hanford and Ontario, Oregon. Based on a cancer mortality rate of 200 fatalities per year per 100,000 people, about 70 cancer fatalities per year, or about 2,800 cancer fatalities over a 40-year period,

Table 5.27. Summary of the Potential Transportation Impacts by Shipment Origin

	Hanford Only Waste Volume			Lower Bound Waste Volume			Upper Bound Waste Volume		
	No Action Alternative	Alternative Groups		No Action Alternative	Alternative Groups		No Action Alternative	Alternative Groups	
		A,C,D, E	B		A,C,D,E	B		A,C,D,E	B
Millions of Shipment-Miles									
Onsite	4.1	4.6	5.5	4.1	4.6	5.5	NA	4.6	5.5
Offsite Shipments to Hanford	<0.1	2.4	0.1	6.4	8.7	6.5	NA	98.5	96.3
Offsite Shipments from Hanford	16.2	34.2	32.0	16.2	38.5	36.3	NA	39.3	37.1
Total	20.4	41.1	37.6	26.7	51.8	48.3	NA	142.4	138.9
Latent Cancer Fatalities ^(a)									
Onsite	0.15	0.23	0.9	0.15	0.23	0.90	NA	0.23	0.90
Offsite Shipments to Hanford	<0.001	0.12	0.0064	0.3	0.41	0.30	NA	4.0	3.9
Offsite Shipments from Hanford	1.8	5.1	5.0	1.8	5.1	5.0	NA	5.3	5.2
Total	2 (1.9)	5 (5.4)	6 (5.9)	2 (2.2)	6 (5.8)	6 (6.2)	NA	10 (9.5)	10 (10)
Non-Radiological Accident Fatalities from Traffic Accidents									
Onsite	0.05	0.055	0.067	0.05	0.055	0.067	NA	0.055	0.067
Offsite Shipments to Hanford	<0.0001	0.015	0.0008	0.11	0.13	0.12	NA	1.8	1.7
Offsite Shipments from Hanford	0.28	0.56	0.54	0.28	0.56	0.55	NA	0.58	0.56
Total	0 (0.33)	1 (0.63)	1 (0.61)	0 (0.44)	1 (0.75)	1 (0.73)	NA	2 (2.4)	2 (2.4)
Note: Total LCFs and non-radiological accident fatalities are rounded to one significant figure. Due to rounding, the sums of the numbers in the table may not exactly match the totals.									
(a) These values are the sums of the potential LCFs from incident-free radiological exposures, probability-weighted radiological accident risks, and incident-free non-radiological emissions.									
NA = not applicable.									

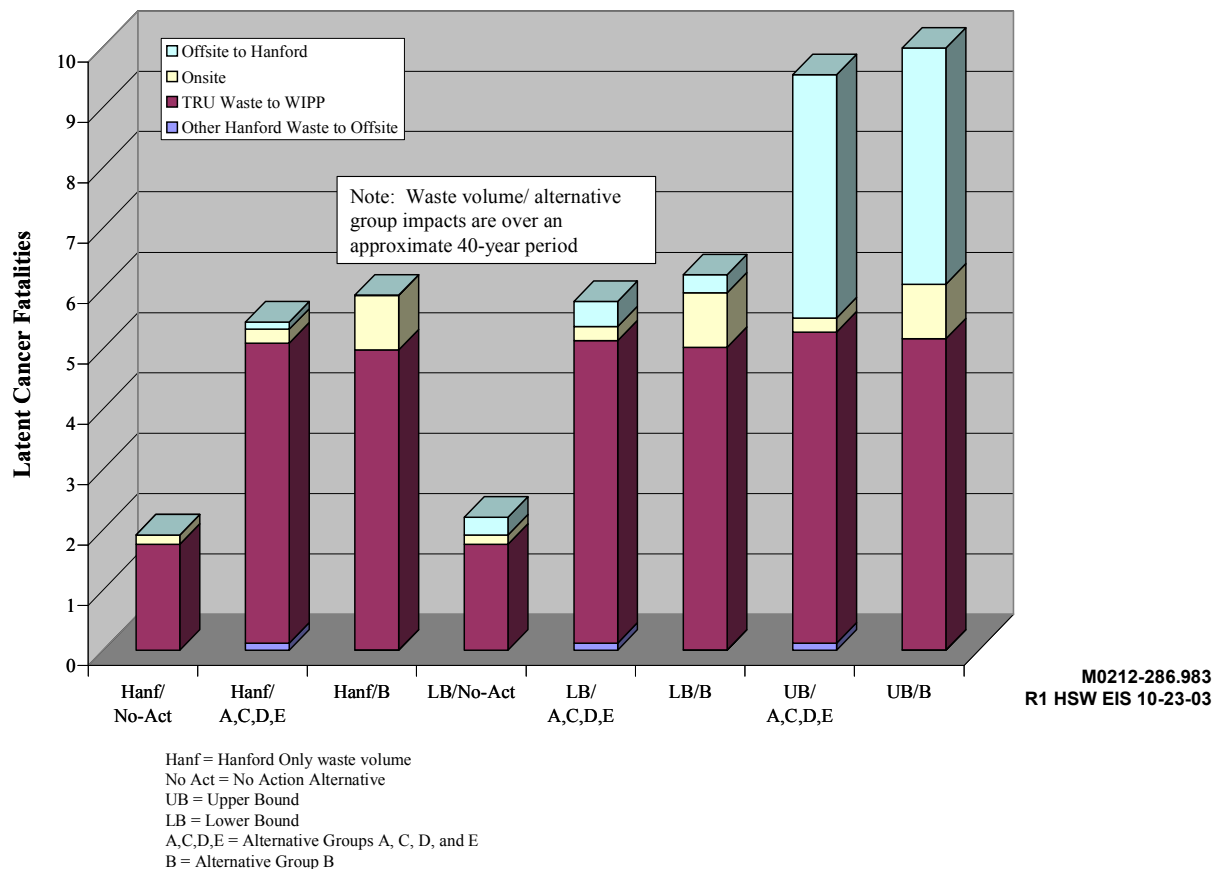


Figure 5.29. Potential Transportation Impacts of Onsite and Offsite Waste Shipments—LCFs from Radiological Incident-Free Transport, Radiological Accidents, and Non-Radiological Emissions^(a)

would be estimated in the population along the route from Hanford to Ontario, Oregon, due to causes unrelated to shipments of waste to and from Hanford. The projected LCFs from the shipments of waste to and from Hanford would not be discernible.

For additional perspective, according to the U.S. Department of Transportation, National Highway Traffic Safety Administration, there were a total of 649 traffic fatalities in the state of Washington and 488 traffic fatalities in the state of Oregon for a total of 1,137 fatalities in the two states combined for 2001 (DOT 2002). This represents about 3 traffic fatalities per day in the 2 states. This can be compared to the total projected impacts of about 2 traffic fatalities over about 40 years for the Upper Bound waste volume shipments. Therefore, the total number of projected traffic fatalities from 40 years of transporting

(a) Although fatalities should be expressed as whole numbers, fractional fatalities are presented to facilitate illustration. Elsewhere fractional fatalities of 0.5 and greater are rounded up to the next whole number.

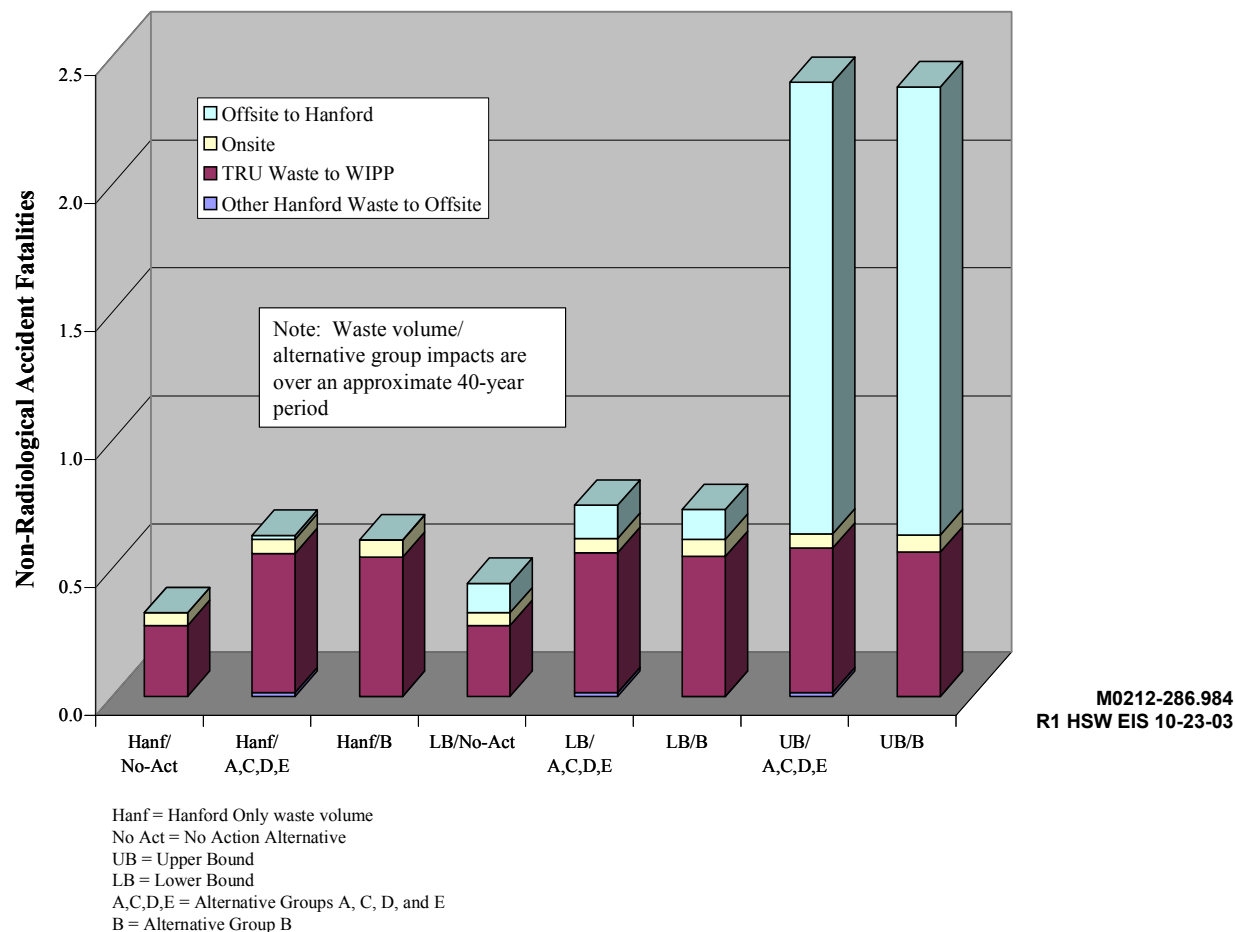


Figure 5.30. Shipment Mileages and Potential Transportation Impacts of Onsite and Offsite Waste Shipments—Non-Radiological Accident Fatalities^(a)

solid waste to, from, and within Hanford is approximately the same as the traffic fatalities that occur, on average, every day in the states of Washington and Oregon. The incremental traffic fatalities from the waste shipments would not be discernible.

The HSW EIS, in addition to presenting a revised nationwide transportation analysis based on actual routes and 2000 Census information, also presents, in response to comments, the potential impacts for the states of Washington and Oregon. Three actual routes through Washington and Oregon were analyzed in this EIS for LLW, MLLW, and TRU wastes (see Figure 5.31). These include a route that enters Oregon from the east on Interstate-84 (I-84) near Ontario, Oregon, and one that enters Oregon from the south on I-5 near Ashland, Oregon. For the Lower Bound waste volume, the Ontario route would be used for about 9,500 shipments, and the Ashland route would be used for about 180 shipments. For the Upper

(a) Although fatalities should be expressed as whole numbers, fractional fatalities are presented to facilitate illustration. Elsewhere fractional fatalities of 0.5 and greater are rounded up to the next whole number.



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Figure 5.31. Shipping Routes in Washington and Oregon

Bound waste volume, the Ontario route would be used for about 34,000 shipments, and the Ashland route would be used for about 1,100 shipments. These estimates include LLW, MLLW, and TRU waste shipments from offsite to Hanford and TRU waste shipments from Hanford to WIPP. For the Hanford Only waste volume, there would be approximately 8,200 shipments of TRU wastes to WIPP for the action alternatives and approximately 4,200 shipments for the No Action Alternative. All of these shipments would use the Ontario, Oregon, route. A third route is included for one MLLW shipment from Puget Sound Naval Shipyard to Hanford via I-90 and I-82. A northern route that enters Washington near Spokane on I-90 was not used in this analysis. Based on actual practice, shipments from midwestern and eastern generators were assumed to travel across country on more southerly routes (that is, I-80 and I-84) to avoid severe winter weather and minimize shipping distances and times.

The waste shipments to Hanford will predominately travel on interstate highways. Only in extremely rare instances would interstate highway or bridge construction lead to a detour through municipal streets. The waste shipments will be conducted using heavy-combination trucks but are not “overweight” vehicles that require special permits. The weights of the trucks that haul the waste to Hanford will be below legal-weight limits, similar to the vast majority of tractor-trailer vehicles that carry cargo on the interstates every day. In addition to the precautions taken by DOE during loading, trucks are subject to weighing and inspecting by state agencies as required.

If a waste shipment encounters a highway or bridge repair situation, it would stay on the interstate wherever possible and would typically not be detoured through cities along the route. If construction/repair of a bridge is taking place, traffic would be detoured to the opposite side of the freeway from where construction/repair is taking place - the open half of the freeway would temporarily become a two-way road. If an entire bridge were to be closed, the most common procedure would be to have traffic exit the freeway at the interchange immediately before the bridge and enter the freeway on the other side of the bridge at the same interchange or at the next entrance. In such cases, having a small number of shipments travel a short distance on routes other than the interstate freeways would not substantially change the transportation risks or conclusions presented in the HSW EIS.

The results of this analysis are presented in Table 5.28. Further details, including shipments and potential impacts by waste type, are presented in Volume II, Appendix H. Note that one radiological fatality was calculated for the Lower Bound waste volume, primarily due to shipments from Hanford to WIPP. The potential impacts are dominated by TRU waste shipments from Hanford to WIPP. Due to the higher volume of LLW and MLLW shipments in the Upper Bound waste volume than the Lower Bound waste volume, the impact estimates are higher; that is, one radiological fatality and one non-radiological fatality from traffic accidents are predicted. There are approximately equal contributions to these potential impact estimates from LLW and MLLW shipments to Hanford and TRU waste shipments from Hanford to WIPP. The full analysis of the potential impacts of transporting LLW, MLLW, and TRU wastes from offsite to Hanford are contained in Volume II, Appendix H of this EIS. The routes used in these analyses and the data used to calculate the impacts include some areas with relatively high traffic hazards, such as Cabbage Hill on I-84 in Oregon. Refer to Section 2.2.4 for further information on emergency preparedness for transportation accidents involving radioactive materials.

The impacts of transporting construction and capping materials to solid waste management facilities on the Hanford Site are summarized in Table 5.29. The materials that were included in the calculations included concrete, asphalt, gravel/sand, silt/loam, basalt, bentonite, and steel. Although some accidents were predicted to occur, there were no predicted fatalities associated with transport of construction and backfill materials. The impacts of all alternative groups were found to be dominated by transport of gravel/sand, silt/loam, and basalt to use as capping materials. The impacts for the No Action Alternative were found to be dominated by the transport of steel and concrete.

The results of the hazardous chemical impact analysis are presented in Table 5.30. The results indicate that downwind concentrations of the hazardous chemicals would not exceed the Temporary Emergency Exposure Limit-2 (TEEL-2) guidelines following a severe transportation accident involving a shipment of maximum-inventory 208-L drums. Additional analyses were performed to determine the impacts of assuming that all of the released materials become volatilized under the thermal effects of a transportation-related fire. This was done by changing the release aerosol and respirable fractions of all of the chemicals to 1.0. This resulted in three chemicals exceeding their TEEL-2 concentrations—elemental lead, elemental mercury, and beryllium. The downwind concentrations of these three chemicals were then compared to their Immediately Dangerous to Life and Health (IDLH) values for additional perspective (see Volume II, Appendix H). The TEEL-2 and IDLH exposure guideline concentrations are defined as follows:

TEEL-2: The maximum concentration in air below which it is believed nearly all individuals could be exposed without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.

IDLH: The maximum concentration from which, in the event of respirator failure, a person could escape within 30 minutes without a respirator and without experiencing any escape-impairing (for example, severe eye irritation) or irreversible health effects.

The downwind concentrations of all chemicals are well below their respective IDLH values. Based on these observations, the conclusion was that releases of hazardous chemicals from possible transportation accidents involving waste materials would be unlikely to result in a fatality. These consequence estimates for a severe transportation accident were also considered to represent the potential impacts of a successful terrorist attack which, based on this analysis, would not be expected to result in catastrophic or wide ranging impacts due to release of chemically hazardous waste constituents.

Table 5.28. Impacts in Oregon and Washington by State from Shipments of Solid Wastes to and from Hanford^(a)

Waste Volume/ Alternative Group	Radiological Impacts, LCFs			Total Number of Accidents	Non-Radiological Impacts	
	Routine Transport		Accidents		Number of Fatalities	Emissions LCFs
	Worker	Public	Public			
Oregon State						
Hanford Only – Action Alternatives ^(b)	0 (0.026)	0 (0.34)	0 (4.2E-4)	1 (1.2)	0 (0.11)	0 (0.023)
Lower Bound – All Alternatives	0 (0.029)	0 (0.37)	0 (7.7E-4)	1 (1.4)	0 (0.14)	0 (0.037)
Upper Bound – Action Alternatives	0 (0.074)	1 (0.59)	0 (4.7E-3)	5 (5.1)	0 (0.48)	0 (0.16)
Hanford Only – No Action Alternative ^(b)	0 (0.013)	0 (0.11)	0 (2.2E-4)	1 (0.60)	0 (0.057)	0 (0.012)
Washington State						
Hanford Only – Action Alternatives ^(b)	0 (8.0E-3)	0 (0.11)	0 (1.3E-4)	0 (0.38)	0 (8.2E-3)	0 (0.036)
Lower Bound – All Alternatives	0 (8.9E-3)	0 (0.11)	0 (2.1E-4)	0 (0.46)	0 (9.7E-3)	0 (0.042)
Upper Bound – Action Alternatives	0 (0.022)	0 (0.17)	0 (1.2E-3)	2 (1.6)	0 (0.034)	0 (0.15)
Hanford Only – No Action Alternative ^(b)	0 (4.2E-3)	0 (0.036)	0 (7.0E-5)	0 (0.20)	0 (4.2E-3)	0 (0.018)
(a) Radiological impacts (incident-free and accident) are expressed in units of LCFs. Non-radiological accident impacts are expressed as the expected number of accidents and the resulting physical trauma fatalities. Non-radiological emissions impacts are expressed as LCFs.						
(b) TRU wastes to WIPP.						

Table 5.29. Impacts of Transporting Construction and Capping Materials

Alternative Group	Waste Volume	Total Distance Traveled, millions of miles	Number of Accidents	Number of Fatalities
A	Hanford Only	8.4	2 (1.5)	0 (6E-02)
	Lower Bound	8.5	2 (1.5)	0 (6E-02)
	Upper Bound	9.4	2 (1.6)	0 (7E-02)
B	Hanford Only	11	2 (1.9)	0 (8E-02)
	Lower Bound	11	2 (2.0)	0 (8E-02)
	Upper Bound	15	3 (2.6)	0 (1.-01)
C	Hanford Only	7.9	1 (1.4)	0 (6E-02)
	Lower Bound	8.0	1 (1.4)	0 (6E-02)
	Upper Bound	8.9	2 (1.6)	0 (7E-02)
D	Hanford Only	7.9	1 (1.4)	0 (6E-02)
	Lower Bound	8.0	1 (1.4)	0 (6E-02)
	Upper Bound	8.9	2 (1.6)	0 (7E-02)
E	Hanford Only	7.9	1 (1.4)	0 (6E-02)
	Lower Bound	8.0	1 (1.4)	0 (6E-02)
	Upper Bound	8.8	2 (1.5)	0 (7E-02)
No Action	Hanford Only	20	4 (3.5)	0 (2E-01)
	Lower Bound	20	4 (3.5)	0 (2E-01)
Note: The materials that were included in the impact analysis were concrete, asphalt, gravel/sand, silt/loam, basalt, bentonite, and steel. Gravel/sand, silt/loam, and basalt were assumed to be transported from Area C on the Hanford Site. Various offsite locations were considered to be the sources for the other materials.				

Table 5.30. Hazardous Chemical Concentrations (mg/m³) 100 m (109 yd) Downwind from Severe Transportation Accidents^(a)

Chemical	CH MLLW	RH MLLW	MLLW Ready for Disposal	RH TRU Boxes	CH TRU with PCBs	RH TRU in Trenches	Elemental Lead	Elemental Mercury	TEEL-2
Acetone	6.9E-03	6.7E-03	6.9E-03	2.6E-05	0	0	0	0	20,000
Beryllium	8.9E-04	8.9E-04	8.9E-04	8.4E-05	8.4E-05	8.4E-05	0	0	0.025
Bromodichloro-methane	3.9E-05	0	3.9E-05	0	0	0	0	0	30
Carbon tetrachloride	1.4E-02	0	1.4E-02	4.5E-03	0	0	0	0	639
Diesel fuel	2.7E-05	0	2.7E-05	0	0	0	0	0	500
Formic acid	3.2E-02	0	3.2E-02	0	0	0	0	0	15
Lead	0	0	0	0	0	0	1.6E-01	0	0.25
Methyl ethyl ketone (MEK or 2 Butanone)	5.4E-03	0	5.4E-03	0	0	0	0	0	750
Mercury	8.3E-06	0	8.3E-06	8.1E-07	0	0	0	2.3E-02	2.05
Nitrate	7.8E-03	0	0	0	0	0	0	0	50
Nitric acid	2.3E-01	2.3E-01	2.3E-01	0	0	0	0	0	15
Polychlorinated biphenyls (PCBs)	9.7E-05	0	9.7E-05	0	3.0E-04	0	0	0	1
p-Chloroaniline	1.9E-02	0	1.9E-02	0	0	0	0	0	50
Sodium hydroxide	3.2E-01	3.2E-01	3.2E-01	1.7E-02	1.7E-02	1.7E-02	0	0	5
Toluene	1.2E-02	3.6E-01	1.2E-02	0	0	0	0	0	1,125
1,1,1-Trichloroethane	2.5E-02	0	2.5E-02	2.6E-05	0	0	0	0	3,850
Xylene	2.1E-03	3.4E-02	2.1E-03	1.4E-04	1.6E-01	1.6E-01	0	0	750
(a) The results presented in this table were calculated assuming a 0.5% respirable release fraction for solid materials and 100% release for volatiles. Assuming a 100% release for all chemicals causes three chemicals, including beryllium, lead, and mercury, to exceed TEEL-2 concentrations. See Volume II, Appendix H, Section H.7 for additional details.									